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Framework for integrated energy system considering flexible demand resources in smart city

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Intelligent energy is an essential part of smart city for meeting environmental pollution and greenhouse gas emissions. More Renewable Energy Sources (RES) are distributed in the urban area, for example, solar panels on the roofs, wind generators in the square and geothermal energy in the neighborhoods. However, the utilization ratio of RES is not high due to its inherent intermittence and fluctuation. Moreover, electricity is becoming the main forms of energy consumption as the increasing proportion of Electric Vehicles (EV) and Thermostatically Controlled Loads (TCL). With the development of Information and Communication Technology (ICT), the electricity industry is undergoing unprecedented revolution to consume these distributed RES by the demand side. Flexible demand resources, such as EVs, TCLs and batteries, have enormous potential in improving the utilization of RES. Two large-scale demonstration projects will establish the prototype of the future intelligent energy system considering flexible demand resources: the EcoGrid EU and the Friendly Interactive System of Supply and Demand (FISSD), which are implemented in Europe and China, respectively. In EcoGrid EU project, small-scale distributed RESs and small end-consumers can actively participate in a real-time electricity market by responding to five min real time electricity prices. It has improved the utilization rate of RES by 8%. FISSD project will take advantage of ICT to realize an efficient interaction between consumers and the smart grid. Around 110,000 residential customers will be selected and equipped with smart devices. It will be one of the largest demonstrations of flexible demand resources in the world.

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